

Potentially toxic cyanobacteria in Chesapeake Bay estuaries and a Virginia lake.

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Introduction

Since 1985, phytoplankton populations have been monitored monthly in Chesapeake Bay (U.S.A) and its tidal estuaries. This surveillance has identified 29 potential toxin producing phytoplankters in these waters which includes representative taxa of dinoflagellates, diatoms, cyanobacteria, and raphidophytes (Marshall 1995, Marshall et al. 2005). Although toxic events attributed to these taxa have been rare, their wide spread presence is noted, with evidence for increased seasonal bloom events indicated for several species in our records. Local studies of HAB's in Virginia's regional lakes have been minimal. However, annual blooms of *Microcystis aeruginosa* have occurred annually in the Potomac River, a major tributary of Chesapeake Bay. This species produced a bloom ($>10^6$ cells ml^{-1}) in 2004 that lasted from June through August and included an extensive area of the river, with microcystin levels consistently recorded at >3 ppb. Decomposition products and wind blown algal masses accumulated along the river shore; these conditions and the high microcystin levels temporarily closed recreational usage in some regions of the river.

Results

M. aeruginosa is a common algal component of the tidal rivers in this region, with significant concentrations annually present in the tidal fresh and oligohaline river sections. Its development farther downstream and into Chesapeake Bay increases during the summer months and is enhanced by periods of extended rain and increased river flow. Other potentially toxic cyanobacteria identified in these rivers have included: *Anabaena affinis*, *A. recta*, *A. solitaria*, *Aphanizomenon flos-aquae*, *A. issatschenkoii*, *Microcystis firma*, *Planktothrix agardhii*, *P. limnetica*, and *P. limnetica* f. *acicularis*. Long term trend analysis from 1985-2004 indicates there are significant increases in biomass and abundance of cyanobacteria within the James, Rappahannock, and York Rivers in Virginia, and as well in Chesapeake Bay. In addition, Lake Burnt Mills, a shallow reservoir of 288 ha located in southeastern Virginia experienced an extensive cyanobacteria bloom in July 2005. This bloom persisted for several days and was produced by *Microcystis aeruginosa* and *M. wesenbergii*, with concentrations of 3.5×10^5 and 22.9×10^5 cell ml^{-1} respectively. During this period microcystin levels near shore exceeded 3 ppb.

Summary

Long term trend analysis of phytoplankton populations in three Virginia rivers and Chesapeake Bay indicate an increase in the abundance of biomass of cyanobacteria has occurred in these waters since 1985. Among these cyanobacteria are populations of potentially toxic species. The most common bloom producing taxon within this group is *Microcystis aeruginosa*. Microcystin concentrations have been associated with these blooms in the Potomac River. Continual monitoring of these rivers and Chesapeake Bay will continue for the presence harmful algal species. In addition, greater surveillance of these bloom producers in regional lakes has taken place and will continue in the future.